

ELECTRONIC APPLIANCES AUTOMATION SYSTEM USING IOT

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Abstract : By the virtue of blooming automation industry and wireless connectivity,all the devices within the home,college,offices and so on can be connected.This improves the comfort,energy efficiency,indoor security,cost savings..In such case,power usage and network bandwidth become a major question.We need a low capacity device that transmits messages through a less vebose protocol.Owing to the ubiquitous availability of wifi, all the appliances with in a region can be commonly connected.This paper presents an overview of a prototype,attempt to implement MQTT on ESP8266, a wifi based development board.Realys are connected to ESP8266, a wifi based development board.Realys are connected to ESP8266 MQTT broker is established for remote control.

IndexTerms: Node mcu,Aurdino,Relay,Voltage regulator.

I. INTRODUCTION

IoT allows objects to be sensed and controlled remotely .The present generation has been experiencing high speed internet by using 4G LTE cellular technology, which allows evolution of swifter IoT-based college automation systems. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which encompasses technologies like controlling of different college appliances like light, fan, water pump and many more. A system has been designed to connect sensor data with user's daily life. There are already many smart phone oriented remote controller products.However current products always have platform compatibility problems and additionally GUI in such systems is complex. This work proposes an approach to enhance and simplify the controlling and monitoring experience. With the use of sensors in college environment remotely based on environmental conditions known from sensor data. The sensor data are processed by a microcontroller and delivered to mobile application through WEB server. This also allows users to observe data and send commands by using their mobile phone application. It allows us to control many devices simultaneously. Our user-friendly interface allows a user to easily control college appliances through the internet. Relays are used to switch loads. The entire system is run by mains power using a step down transformer, rectifier, filter and a linear dc regulator. After receiving user's commands over the internet, microcontroller processes these instructions to operate these loads accordingly and display the system status on mobile application. Thus this system allows efficient college automation over the internet.

The project discusses how a system has been implemented to make use of IoT for controlling college appliances using Node MCU and Blynk app. The different parameters of the current environment are sent as input to Node MCU through the sensor-modules. Node MCU receives instructions from user's mobile application and processes them to control actuator circuits of college appliances. The rest of this project is organized as follows. Section II briefly discusses the related work in this field. Section III describes the system design. Architecture and implementation of proposed system are presented in Section IV. Experimental results are shown and discussed in Section V. Section VI concludes this project and outlines future research.

II. LITERATURE SURVEY

Kumar Mandula discusses about the process of college automation using Bluetooth and Ethernet. When connectivity between Arduino and smart phone is established using Bluetooth, short range wireless communication is possible in an indoor environment. Ethernet module is used for connecting Arduino board from any part of the world.

Bharat Bohora designed a system based on Blynk framework which controlled and monitored appliances via smartphone by using Wi-Fi as communication protocol and raspberry pi as private server. All the appliances and sensors are connected to the internet via NodeMCU.

Ming Wang in his project discussed about a system that uses a smart central controller to set up a 433 MHz wireless sensor and actuator network (WSAN).

P.Siva Nagendra Reddy used android mobile to send commands to the Arduino board through Wi-Fi module and Arduino processed them to control all the college appliances. This system controlled the voltage levels of college appliances like fan, light etc.

M L Sharma developed a system in which a college automation system was interfaced with Android mobile devices using wifi..

Somnath Singh in his project discussed about designing a web-based control of college appliances which allowed user to switch appliances on/off by clicking on a webpage specially designed to interact with those devices, through anywhere in the world with a computer or a smart phone connected with the Internet.

Miss. Aboli Mane used Blynk app in her project of college management system and security. Different sensors were connected with Node MCU. With the help of Wi-Fi, Node MCU was connected with Blynk app. On detection of any unwanted incident by different sensors, messages were sent to Blynk app.

III.SYSTEM DESIGN

The designing methodology of the system has two major portions: software design and hardware design. The specifications and information regarding various components are described below. The system is modelled to monitor data from three sensor-modules and control three loads by using mobile application. The proposed system appears as illustrated in fig1.The various functional units used in the system are as follows:

1. Node MCU (Node MicrocontrollerUnit) -It is the central co-ordinator of the sensors and the actuators. This microcontroller has built-in support for Wi-Fi connectivity which allows it to send and receive data from mobile application via internet server. It then drives the relay-module to control the appliances.
2. Sensor modules –They receive information about current ambient conditions in college environment and send them to node MCU. The following three sensor modules are used:
 - (a)DHT 11 -It is used for sensing the ambient temperature and humidity prevailing in the room.
 - (b)Light sensor -It is used to know the condition of illuminance prevailing in the room.
 - (c)Ultrasonic sensor -It is used to measure the depth of water level from the brim of tank.
- 3.Mobile application- Blynk, a platform with IOS and android apps, provides widgets to display sensor data received from node MCU and control output signals(to control loads) from node MCU to the actuator circuits.
- 4.Internet server-Blynk mobile application in smart phone and node MCU communicate by using Blynk server. Bidirectional transfer of data between node MCU and mobile app occurs through this server.
- 5.Switching modules-One such module is used for turning light on/off and the other one is used for turning water pump on/off. The output signal from node MCU activates and deactivates the relay to perform switching operation.
- 6.Interfacing module-Besides having relay, this circuit consists of a diac, a triac, a capacitor and two resistances with different values for obtaining high and low speeds by altering firing angle of a triac.

IV. SYSTEM ARCHITECTURE AND IMPLEMENTATION

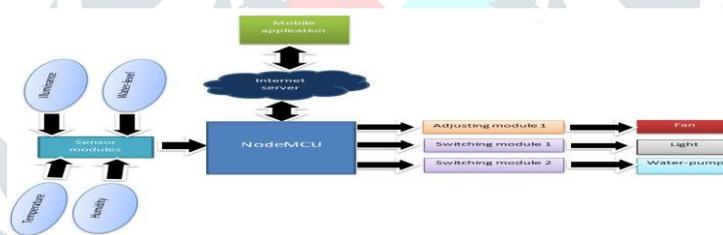
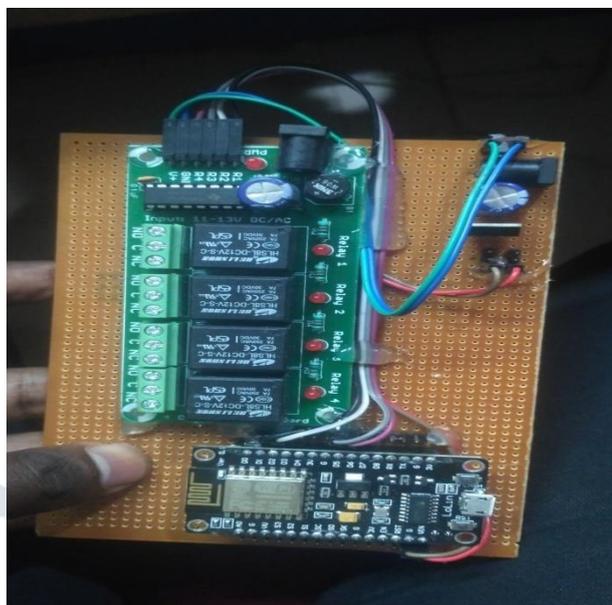


Fig.1 Overview of the proposed system

The proposed system allows the user to control the appliances of his college remotely anytime from anywhere by using smart mobile phones. The user can control his appliances via internet by using mobile application and monitor parameters of his household environment easily by reading sensor data in his mobile application. Fig.2 shows the entire setup of the proposed system. ADC power supply of 5V is used as the power source for node MCU, sensor-modules and the relay board. Being powered up, node MCU searches for the preset SSID (Service Set Identifier) and connects automatically to the Internet. Sensor-modules send the variable data about ambient conditions to the node MCU. The user gets these data in his mobile application via internet server and then decides his action to control the appliances. On pressing the suitable button in application, node MCU gets the instruction via internet server and provides output signal to the actuator circuits. When the relay is turned on, the appliances get the power from 230V AC source. The switching circuit used for turning light and water-pump on/off can be used for turning the other household appliances like fan, air-conditioner, room heater, micro-wave oven etc. on/off as well. To control the speed of fan user checks his application display to read values from DHT11 module about ambient temperature and humidity. User presses proper buttons in his app to adjust the speed of fan. The designed system provides a two-level speed controlling mechanism. Fig.2 shows the system architecture.



V. RESULTS

The Blynk application provides the facility to read data and control appliances easily. For three appliances there are three different tabs namely light, motor (for water pump) and fan. In each tab there is a display widget which shows sensor reading presently fetched from nodeMCU via Blynk server and the button widget is clicked to change the state of appliances. The present state (on/off) of appliance appears on the button widget. The screenshots captured in mobile while using the application show the results of controlling different appliances.

Light on/off: Fig.3 and fig.4 show application screen on light tab. The display widget, labeled as brightness, shows the ambient illuminance. The button widget shows the present status (on/off) of light. User turns light on/off by pressing the button.

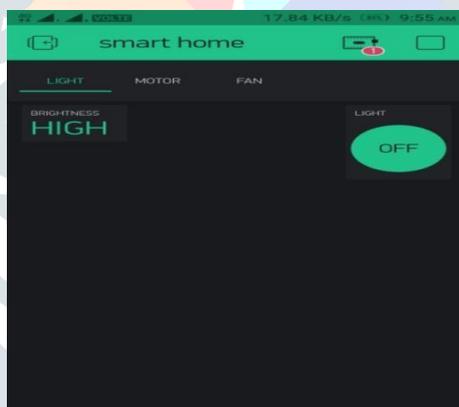


Fig.3: Application screen on light tab shows brightness is high and light is off

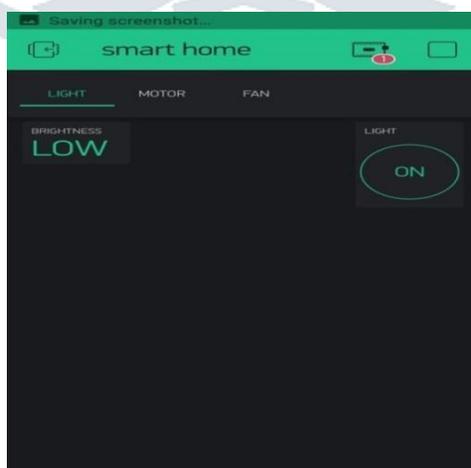


Fig.4: Application screen on light tab shows brightness is low and light is on

Fan speed control: When the tab named as fan is used, one display widget on the top-left corner shows ambient temperature and the other on the top-right corner shows humidity. When only the button labeled as hi is clicked the fan speed is high whereas when only the

button labeled as low is clicked the fan speed is low. When both the buttons are off then the fan is off but when both the buttons are on then the fan rotates at high speed. The application screen is shown in fig.5 and fig.6.

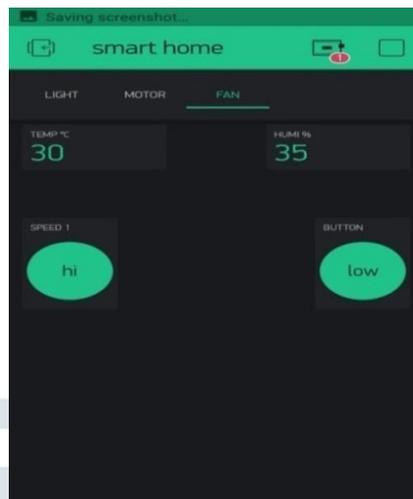


Fig.5: Application screen on fan tab shows both buttons are on

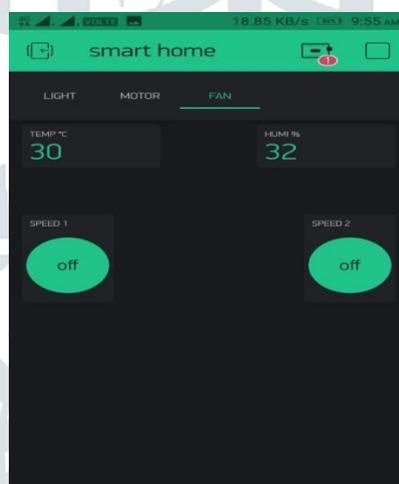


Fig.6: Application screen on fan tab shows both buttons are off

Water-pump on/off: On sliding to the tab motor we see three widgets – the leftmost one is the button, the middle one is the notification and on the rightmost corner there is display. Button is used for controlling pump on/off based on ultrasonic sensor value on display widget. When displayed value touches the limit for water-level then notification widget notifies about the overflow of water from tank. Fig.7 shows normal application screen on motor tab, fig.8 shows the notification when mobile phone user is not working on the application. So even during normal activities in mobile, the user gets a notification when water is about to overflow from tank.

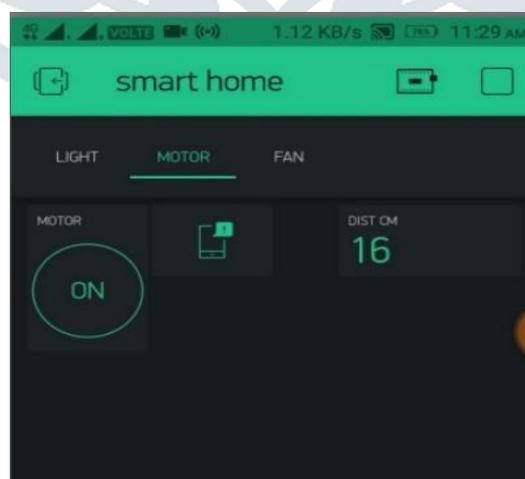


Fig.7: Application screen on motor tab shows status of motor and reading from ultrasonic sensor

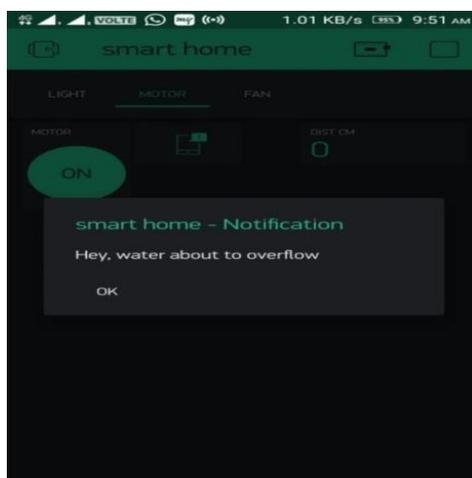


Fig.8: Notification on mobile screen when user is working on application

VI. FUTURE SCOPE:

This application can be extended to apply on high voltage devices by considering different requirements through different modules.

VII. CONCLUSION

This work can further be upgraded by using different sensors and different college appliances. Since smart phones are widely used nowadays, this user-friendly system will be benefitting the mass. The cost of the system is also within reach. The circuit used for controlling ups system can also be implemented. The features of automatic turn off and sending emergency notification can be very useful in turning ups off/on. When water is heated to a particular temperature in geyser, it can be automatically turned off or when room temperature is lowered to a specified value the air-conditioner can be turned off automatically. In both the above cases notifications can also be sent to user through his/her Blynk app. Mobile application development companies with dedicated teams are working extensively on IoT-based applications that are connected to the cloud. Not only old-aged or physically challenged people can be benefitted using this, but any person with an android phone can monitor and control the electronic devices without much difficulty. The growth of these techniques will provide a way to success in automation fields.

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